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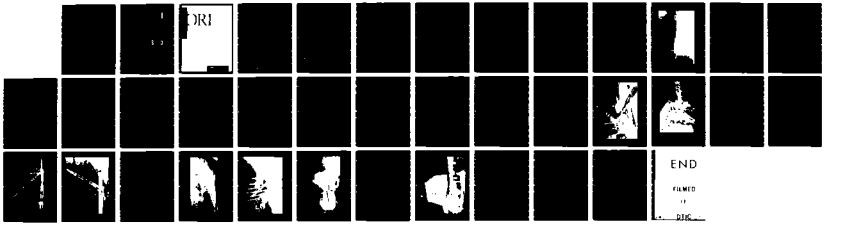

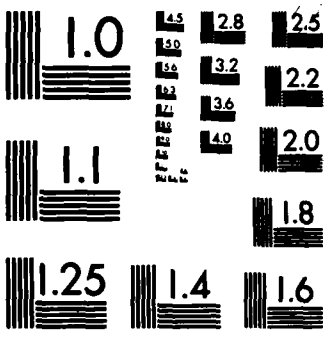

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THE JOINT LOGISTICS-OVER-THE-SHORE (LOTS) TEST AND EVALUATION PROGRAM REPORT

EXECUTIVE SUMMARY

5 JANUARY 1979

PREPARED UNDER:

CONTRACT NUMBER MDA-903-75-C-0016
FOR THE OFFICE OF THE SECRETARY OF DEFENSE
OFFICE OF THE UNDER SECRETARY OF
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Barge Ships	Container	Deployment	Heavy Lift
Beach Handling	Containership	Elevated Causeway	Joint Test
			LACV-3

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is the final report on the Joint Logistics-Over-the-Shore (LOTS) main test, consisting of an Executive Summary, Volume I - Conduct of the Test, and Volume II - Analysis of Test Results. A classified report based upon the test results was published separately (ORI, Inc. TR No. 1468) dealing with LOTS requirements to support a non-mobilization contingency situation. Additional reports were published on an automated data base and a LOTS simulation model. The main test was preceeded by a one-year pretest phase dealing with deployment of LOTS equipment on a conventional breakbulk ship, a LASH, a SEABEE, and a

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LARC-LX	LOTS	RO/RO
LASH	Marshaling Yard	SEABEE
LCU	Merchant Ships	Sealift Readiness Program
Lighterage	MHE	Ship Off-loading
Loading	Mobilization	Ship-to-Shore
Logistics	OSDOC	TCDF
	Over-the-Shore	Temporary Container Discharge Facility
	Roll-on/Roll-off	

Terminal Operations
Test and Evaluation
Throughput
Transportation

(20. continued)

heavy-lift breakbulk ship for which reports were also published.

The Joint Logistics-Over-the-Shore (LOTS) test was conducted in the Norfolk-Ft. Story, Va., area during the period 8 July to 21 August 1977. The test was conducted under the sponsorship of the Director, Defense Test and Evaluation, Office of the Under Secretary of Defense for Research and Engineering, with the Army as Executive Agent and the CG of the U.S. Army Transportation School at Ft. Eustis, Va., as the Joint Test Director. The Army, Navy, and Marine Corps each provided a Deputy Director and participating test units, data collectors, and evaluation personnel for selected system elements.

The overall objective of the test was to verify the Services' capabilities for conducting LOTS sustained throughput operations. Specific test objectives for the OUSDR&E test sponsor related to equipment performance, operational techniques, and planning factors.

The primary findings were that in a LOTS environment the Services do not yet have a capability of providing bulk POL support from large tankers offshore to a corps size force or deploying a non-self-sustaining containership discharge system in a contingency situation. However, for container operations the Services can now acquire the equipments needed to support such contingencies. After equipment shortfalls are made up, LOTS type operations still involve a high degree of uncertainty in continuity of operations. Nevertheless, they remain an essential means of providing logistic support to a contingency force. The Services must provide required redundancy to safeguard against environmental and military threats.

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JOINT LOTS MAIN TEST

GENERAL SUMMARY

The Joint Logistics-Over-The-Shore (LOTS) test was conducted in the Norfolk-Ft. Story, Va., area during the period beginning 8 July with the disassembly of the 300-ton crane to 21 August 1977 when retrograde from Ft. Story began. The test was conducted under the sponsorship of the Director, Defense Test and Evaluation, Office of the Under Secretary of Defense for Research and Engineering, with the Army as Executive Agent and the CG of the U.S. Army Transportation School and Ft. Eustis, Va., as the Joint Test Director. The Army, Navy, and Marine Corps each provided a Deputy Director and participating test units, data collectors, and evaluation personnel for selected system elements. This is the final report on the test. This evaluation was reviewed and comments were received from the Services prior to publication.

The primary finding is that in a LOTS environment the Services do not yet have a capability of providing bulk POL support from large tankers off-shore to a corps size force or deploying a non-self-sustaining containership discharge system in a contingency situation. However, the Services can now acquire the equipments needed to support such contingencies. After equipment shortfalls are made up, LOTS type operations still involve a high degree of uncertainty in continuity of operations. Nevertheless, they remain an essential means of providing logistic support to a contingency force. The Services must provide required redundancy to safeguard against environmental and military threats.

I. SUMMARY OF LOTS SYSTEM CAPABILITIES

MAJOR GAPS IN CURRENT CAPABILITIES

Bulk POL

At this time the Army does not have equipment in hand to equip units. deploy, install and discharge tankers off-shore, pump to storage facilities, and distribute POL to a large force ashore. A system to achieve an interim capability is scheduled to be tested in the fall of 1979. The Navy has a limited capability for Marine Amphibious Force (MAF) support but cannot accommodate a larger force or large tankers.

Discharge of Roll-On/Roll-off Ships

A system for transferring vehicles from RO/RO ships to lighters in an open roadstead is not available at this time. The Navy is developing an austere but limited system which employs cranes on the deck of a ship hull, most likely to be a tanker.

DEPLOYMENT CONSIDERATIONS

The Army has only one set of equipment for unloading non-self-sustaining (NSS) containerships: a 300-ton crane on a B DeLong barge (barge temporary container discharge facility or barge-TCDF). This assembly can only be deployed by a SEABEE ship and there are only three of these type merchant ships (see Figure 1.1). Therefore, the Army at present has no assured means of deploying these items in a quick-reaction non-mobilization situation. The alternative, deployment by towing, is not feasible.

The Navy's developmental crane-on-deck system consisted of a leased crane on one set of load spreader ramps which demonstrated the feasibility of the concept. No acquisitions for fleet capability are being planned because an alternative, i.e., a ship temporary container discharge facility or ship-TCDF,

FIGURE 1.1 SEABEE LOADS BARGE-TCDF. As a special check test the Army barge-TCDF was lifted aboard a SEABEE vessel (not available for the main test). A minor modificiation to the ship's barge transporters is needed to move the TCDF forward to a stowage location.(see ORI, Inc., SEABEE Pretest Results of the Joint Logistics-Over-The-Shore (LOTS) Test and Evaluation Program, 7 Dec 1977, TR No. 1267).

has been selected for reasons of economy and capability. This alternative involves placing two cranes on a self-deployable ship hull and was a Navy POM-82 procurement issue. Acquisition is on the basic level and six TCD cranes and foundations will be procured.

All other elements of a LOTS or LOTS-like amphibious resupply operation can be deployed by commercial vessels available to MSC under charter and Navy amphibious ships. To reduce vessel requirements to a minimum and provide the best response time, priority is required for the use of barge carriers (especially SEABEES) and heavy-lift ships for deployment of LOTS outsized, heavy equipment. Additionally, improved inter-service coordination and standardization are needed.

PLANNING FACTORS AND SUBSYSTEM CAPABILITIES

The Services have acquired LOTS subsystem elements which when deployed and assembled represent significant capabilities. Total system productivity for each of the Services is paced by ship discharge capabilities which were found to be the system bottlenecks. At present, due to limited assets available, a joint operation would provide the only DoD LOTS container capability.

Army

The Army has fully outfitted one container handling company for shoreside operations but has only one barge-TCDF containership discharge system. A second barge-TCDF will be operational in FY 80. A bare beach capability was tested in Phase I using landing craft at a 300-ton crane-on-jetty while amphibians were off-loaded by a 140-ton crane at an amphibian discharge point. In Phase III a jacked-up DeLong pier was tested as part of the Army's improved beach method for container handling. The shoreside transfer systems were proved capable of meeting ship discharge rates. For the Army system supported by two barge-TCDFs the capability is 265 containers per day. Overall, with 25 percent fewer personnel the productivity of the container handling terminal service company is about 3.5 times that of a breakbulk unit.

Navy

The principal elements of the Navy's Container Off-loading and Transfer System (COTS) tested were the crane-on-deck and elevated causeway. Shoreside elements were provided by the Marine Corps.

The crane-on-deck was found to be slightly slower in container transfers than the barge-TCDF because the operator on the barge-TCDF had better visibility. A two-crane-on-deck discharge system capability is 250 containers per day.

Marine Corps

The Marine Corps tested a lightweight amphibious container handler (LACH), a modified version of the M-127 semi-trailer, an M-52 tractor, and a 30-ton Drott Crane.

The LACH, designed only for 20-ft containers, worked well on the beach unloading landing craft and loading trucks. Its capability was rated at 120 containers per day. The LACH may also be used in the Logistic Support Area.

The M-52/M-127 tractor-trailer and the 30-ton Drott crane were found to be marginally suitable as interim equipment for container operations.

SUMMARY OF PLANNING FACTORS

Based upon analyses of LOTS test results, a series of planning factors were developed for a LOTS force operating in a relatively calm sea state (sea state 1) with beach conditions analogous to Red Beach, Ft. Story. These factors are set forth in Table 1.1 for Army bare beach and improved beach capabilities (using barge-TCDFs) and for a Navy-Marine Corps amphibious force using cranes-on-deck. Table 1.2 provides Army unit planning factors. Navy and Marine Corps participants were task organized for the test and data were provided to assist in developing amphibious force planning factors, subject to completion of RDT&E, including fleet OPEVAL.

TABLE 1.1

EQUIPMENT PLANNING FACTORS FOR CONTAINER OPERATIONS

TRANSFER SYSTEM	NUMBER EMPLOYED	CAPABILITY IN CNTNRS/DAY
ARMY		
Ship Transfer System		
Barge-TCDF	2	265
Shoreside Transfer Systems (Bare Beach)**		
Crane-on-jetty	1	155/210*
Amphibian Discharge Crane	1	225
Shoreside Transfer Systems (Improved Beach)**		
DeLong pier	1	200
Amphibian Discharge Crane	1	225
NAVY-MARINE CORPS		
Ship Transfer System		
Cranes-On-Deck	2	250
Shoreside Transfer Systems**		
Elevated Causeway	1	195
LACH	2	240

* Provides capability with and without 2½ hr tidal delay at each tide.

** Not limiting if both subsystems are available.

TABLE 1.2

UNIT PLANNING FACTORS FOR CONTAINER OPERATIONS

UNIT	CAPABILITY (CNTNRS/DAY)
Terminal Service (Container) Company	265
Medium Boat Company (16 craft authorized, 12 available)	385
Heavy Boat Company (12 craft authorized, 9 available)	
LCU 1466-class	330
LCU 1646-class	350
Medium Amphibian Company (LARC-XV) (24 authorized, 18 available)	350*
Amphibian Barge Team (LARC-LX) (4 authorized, 3 available)	85
Medium Amphibian Det. (ACV) (2 available)	80

*Limited to containers of 15 s/tons or less

II. CONDUCT AND ORGANIZATION OF JOINT LOTS TEST

PURPOSE AND OBJECTIVES

The overall purpose of the test was to evaluate the capabilities of the Services to conduct LOTS type operations with the basic objective of providing information which can be used by the Services to:

- Alter or confirm
  - Operational techniques
  - Planning factors
  - Equipment requirements.
- Determine the best force structure for efficient use of manpower.

BACKGROUND

During the summer of 1977, the largest logistic test of its kind involving intermodal cargo systems was conducted in the Ft. Story, Virginia area. A task force comprised of Army, Navy, and Marine Corps personnel combined in the joint use of specialized as well as the most modern dry cargo ships in the US merchant fleet.

Modern technology has greatly complicated support of military forces overseas. They increasingly consume more supplies, especially ammunition and POL. With containerization quantum jumps were made possible in terms of tonnage delivered versus manpower and time required. However, containerships became port dependent, requiring specialized cargo handling cranes and equipment for loading and off-loading.

The heart of today's LOTS problem lies in the ability of the Services to off-load containerships in a LOTS environment where ships are at anchor. They must either be capable of loading and off-loading themselves or have an available on-site loading/off-loading system. Systems developed to date provided the basis for the Joint LOTS Test and Evaluation Program.

PRINCIPAL UNITS TESTED

- ARMY
  - HHC, 24th Transportation Battalion (Terminal)

    119th Transportation Company (Terminal Service) (Container)
    567th Transportation Company (Terminal Service)
    329th Transportation Company (Heavy Boat)
    1098th Transportation Company (Medium Boat)
    309th Transportation Detachment (Heavy Amphibian)
    LACV-30 Team
    497th Engineer Company (Port Construction).

- NAVY
  - NAVAL BEACH GROUP TWO

    Amphibious Construction Battalion TWO
    Assault Craft Unit TWO
    Beach Master Unit TWO
    Navy Cargo Handling and Port Group.

- USMC
  - 13th Marine Support Element

    Detachment, 2d Force Service Support Group
    Detachment, Division Support Group.

INITIAL READINESS POSTURE

The units participating in the test had only minimal training in discharging a containership and no significant experience in operating and managing a container supported LOTS throughput system. Much of the equipment used was new and in several cases had not been used operationally at all. Consequently, learning factors contributed to the low initial results. After one phase of operations, about five days, shipside and overall system management improved and experience levels were attained to raise productivity to two or three times that of initial levels.

CONCEPT OF OPERATIONS

Under the daily monitorship of the Joint Test Director and his staff and following completion of deployment, the test was conducted in three separate operational phases. This was necessary in order to accommodate differences in Service missions, doctrine and procedures concerned with LOTS type operations. Additionally, in order to limit the types of commercial shipping available for deployment, a quick reaction, non-mobilization scenario was used in Phase I, a worst case, bare beach situation. General mobilization was assumed for subsequent phases. Operations were conducted around the clock, seven days a week, in two shifts with a planned work day of 20 hours.

DEPLOYMENT

A major consideration of the test was to determine the time to prepare equipment, embark it on a commercial vessel, move to an anchorage, off-load equipment off-shore, transport it to shore on available lighterage, and bring it to an operational status.

The main test was preceded by a series of preliminary field tests in 1976 to examine a number of possible alternative deployment means for ocean transport of the large, heavy equipment items and ship-to-shore lighterage that had not previously been deployed by the Services. The preliminary tests were necessary because there had been no previous determination that the heavy equipment needed in a LOTS environment could be deployed in available merchant ships and lighters. These joint LOTS pretests and evaluation efforts included the testing of a conventional breakbulk ship, a LASH vessel, a heavy-lift breakbulk ship, and a SEABEE vessel.

The Army was the only Service tested in all stages of actual deployment of major items of LOTS equipment. Navy and USMC items were assumed to have been deployed by amphibious assault shipping. The major pacing items of the Army were the movement of the large container handling cranes and lighters which were processed and moved within the allowable time frames.

OPERATIONAL TEST PHASES

Phase I -- Bare Beach Operations -- Non-mobilization Scenario

JTF Commander: US Army Transportation Group (Terminal).

Major Operational Unit: 24th Transportation Battalion (Terminal).

This phase of the test involved the simultaneous handling of breakbulk cargo and containerized cargo from two vessels: a heavy-lift breakbulk ship and a non-self-sustaining containership. The breakbulk cargo was handled separately from containers, using a different terminal service company. The major container handling subsystems tested were:

- Ship discharge -- An Army 300-ton crane mounted on a B DeLong barge and a Navy crane-on-deck, described in Phase II. Both were employed to provide a two-crane discharge rate throughout the test.

- Lighters -- A mix of conventional landing craft (LCUs and LCM8s) and amphibians (LARC-LXs and LARC-XVs), and two air cushion vehicles (LACV-30s).

- Shoreside container transfer elements -- A 300-ton truck crane on a sand jetty for unloading landing craft and a 140-ton truck crane to unload amphibians.

- Beach clearance -- A new yard tractor designed for fixed terminal operations, and a 34-ton semi-trailer designed for port and line-haul work. Both were tested for suitability in a LOTS environment.

- Container MHE -- Newly acquired sideloaders and frontloaders were the principal items of interest. The rough terrain frontloader was used both on the beach and in the marshaling yard. The sideloader was briefly used in a lightly surfaced area only.

- Marshaling yard operations -- Management, area layout, and suitability of a hastily prepared area for sustained container operations were included in the evaluation.

- Cargo management and movement control -- A Remote Processing Facility (RPF) to provide required documentation using automated procedures was a major test item. However, it did not become fully operational in Phases I and II because of missing and late manifest data transmitted by Military Traffic Management Command (MTMC).

Phase II -- Amphibious Follow-On Echelon Operations -- Mobilization Scenario

Amphibious Task Force Commander: Commander, Naval Beach Group TWO

Major Operational Units: Naval Beach Group TWO and 13th Marine Support Element.

Phase II involved the discharge of containers from a NSS containership and their movement to shore and over the beach to a logistic support area. Major systems tested were:

- Ship discharge -- A leased 200-ton capacity commercial crane mounted on one of two pair of load spreading beams permitting the crane to move from hatch to hatch in discharging the ship. The Army barge crane continued to operate but used Navy crews during this phase to provide adequate data collection and the required two-crane throughput rate.

- Lighterage -- Navy 1646-class LCUs and LCM8s, floating causeway ferries with warping tug and LCM6 tender boats. Priority was given to the LCUs, then to LCM8s, and if no landing craft were immediately available, containers were loaded on a prestaged causeway ferry.

- Shoreside container transfer subsystems -- A leased 140-ton truck crane on an elevated causeway discharged containers from lighters directly to Marine Corps vehicles. To permit quick turnaround for the truck-trailer units, a powered turntable was employed. The second container transfer element tested was the Marine Corps Lightweight Amphibious Container Handler (LACH). This prototype vehicle, received only 5 days prior to the test, unloaded containers from beached landing craft and transferred them to either the beach interim storage area or loaded them on waiting trucks.

- Beach clearance motor transport -- The Marine Corps M-52 tractors and modified M-127 semi-trailers were tested as interim vehicles for transporting containers to the base supply area pending acquisition of a vehicle designed for that purpose. The modifications to the trailer featured container positioning guides and corner locking pins.

- Container MHE -- The Marine Corps 30-ton Drott crane, intended for handling breakbulk cargo, was tested for suitability in handling containers in a logistic support area. Army MHE augmented the Drott cranes in order to handle the volume of containers received and transhipped.

- Logistic Support Area (LSA) operations -- The Marine Corps operated the LSA using the 30-ton Drott cranes, augmented by Army frontloaders and operators. A manual system of documenting containers and recording stow locations in the LSA was used.

Phase III -- Joint Terminal Operations

JTF Commander: US Army 7th Transportation Group (Terminal).

Major Operational Units: 24th Transportation Battalion (Terminal)
Naval Beach Group TWO
13th Marine Support Element.

Phase III also involved the discharge of containers from the containership using the same ship discharge systems used through Phases I and II. At the end of Phase II control of joint operations including lighters and shoreside facilities was assumed by the Army Joint Task Force commander. An important aspect of this phase was directing total container discharge to one shoreside container transfer facility until it was saturated, then shifting to saturate the second. Differences in systems tested in Phases I and II were:

- Ship discharge -- Army barge crane and Navy COD manned and operated by crews from their respective Services.

- Lighters -- The resources of the Army and Navy were pooled and placed under direction of joint lighter control. Priority of discharge was given to LCUs, secondly to LCM8s. Amphibians were not used except in retrograde of containers in preparation for Phase I(R) (Phase I Repeat).

- Shoreside container transfer -- A 140-ton capacity crane on a jacked-up DeLong pier operated by the Army transferred containers from moored landing craft direct to Army transport.

- Cargo Management and Movement Control -- During this period the Remote Processing Facility was fully operational preparing tallies, cargo disposition instructions, and TCMDs for shipments to consignees. Periodic status reports were produced reflecting containers still on board ship, received at the marshaling yard, shipped to consignees, and on hand.

With ship charter time remaining, a 24-hr period was scheduled for discharge of the containership in a bare beach situation, a repeat of Phase I. The systems available and used by the Army were the same as Phase I.

III. ANALYSES OF TEST RESULTS

GENERAL

The following is a summary of the analyses of test results based upon computerized and manual data reductions of the automated JTD data base, in-depth samples of container transfer activities, reports and reviews of the Service evaluations and LOTS simulation model results.

DEPLOYMENT

Preparation and Movement to Operational Area

The Army LOTS units and equipment were prepared for movement, off-loaded, and made ready for operations well within the prescribed test time frames. Except for the sailing time enroute, the Army container handling company can move from home station, embark in port, lighter ashore, and become operational in about 5 to 7 days, assuming the availability of adequate shipping.

Shipping Requirements

The timely deployment of an Army LOTS force requires considerable specialized shipping. One container handling company requires one SEABEE to deploy its two barge-TCDFs and a 2-section DeLong pier. The remainder of the ship is not well suited for vehicular cargo to be discharged off-shore except for LCM8s and amphibians. Additional heavy lift shipping is needed for the LCUs, LARC-LXs, and other heavy equipment. Conventional breakbulk shipping could deploy the unit's routine cargo and one or two medium lighters per ship; but this would necessitate 10 ships or more to transport lighterage and shore-side equipment for a one containership system. Such a system still would lack a ship discharge capability since no barge-TCDF could be deployed without a SEABEE ship.

Table 3.1 provides a list of shipping requirements for two notional cases. In the first case, there is a one containership plus one breakbulk ship LOTS requirement. In the second case, there is a three containership and one breakbulk ship requirement, which is actually the maximum capability that can be deployed in a one-time lift. The latter case could support most of the D+50 to 60 corps size force resupply requirements.

TABLE 3.1

ARMY LOTS FORCE DEPLOYMENT REQUIREMENTS TO SUPPORT TEST CASE AND CORPS SIZE FORCE

SHIP TYPE	SHIP REQUIREMENTS AND ESTIMATED SPACE UTILIZATION			
	One Containership Plus One Breakbulk Ship		Three Containerships Plus One Breakbulk Ship	
	No. Ships	Utilization	No. Ships	Utilization
Conventional Breakbulk	5	13%	4	95%
LASH			1	35%*
Heavy-lift Breakbulk	2	87%	2	95%
Heavy-lift RO/RO	1	24%	1	95%
SEABEE	1	35%	3	35%

*One LASH releases four breakbulk ships since it carries more lighters; this reduces the total requirement by 3 conventional breakbulk vessels for supporting the "three plus-one" off-load capability.

Each of the above deployments requires the use of the only two heavy-lift breakbulk ships and the only heavy-lift RO/RO ship in the US flag fleet. Also, there are only three SEABEE ships in the US flag fleet and all three would be required for the larger force. Consequently, the need for specialized shipping to deploy the Army LOTS force is considered a major limitation. To insure the deployment of large, outsized LOTS equipment along with other force requirements within required response time, priority in the allocation of scarce heavy-lift ships is required. Also, the Sealift Readiness Program should be tested to determine problem areas, communications channels, and procedural response times for acquiring needed sealift assets.

IMPACT OF ENVIRONMENTAL CONDITIONS

LOTS operations may be exposed in open roadsteads; thus, results will be strongly affected by sea and weather conditions. Rising sea states rapidly diminish the productivity of ship unloading systems. Heavy surf impacts unfavorably on the handling of lighters alongside piers and in traversing the surf zone. Although breakbulk cargo has been handled in LOTS operations in rough weather, the adverse affects of sea and weather on container operations is much more severe.

Throughout the test period, weather conditions were exceptionally favorable for LOTS operations. Only the effects of brief periods of moderately high winds and choppy surface waves were noted. No significant swells from the sea were experienced. However, conditions were severe enough that as sea state three was approached the barge-TCDF was forced to temporarily halt operations. The crane-on-deck was able to continue operations during the same period.

SHIP UNLOADING SYSTEMS

Barge-TCDF

- A 300-ton capacity crane on a B DeLong Barge (See Figure 3.1). The barge-TCDF has deployment and sea state limitations that are critical weaknesses. Nevertheless, it is the only TCDF system in being in active units now. The barge-TCDF was relatively easy for lighters to moor to and the operator could see the lighters as well as the deck area which was an advantage over the crane-on-deck. Daily productivity varied from 54 to 134 container transfers. The average capacity of the two-crane system was rated at 265 container transfers per day. Presently, the Army has one barge-TCDF unit. An additional barge-TCDF is programmed for FY 79.

Crane-On-Deck

- A 200-ton capacity crawler crane on steel spans to bridge hatches (See Figure 3.2). Since components of the crane-on-deck were not available for use until just before the test, test participants were less familiar with the COD system than with the barge-TCDF. Greater reliance was necessary for good communications between the signalman and the crane operators because the crane operator could not see what was happening in the lighter or below decks. The crane-on-deck was slowed also by the artificiality of having to move considerable instrumentation and an umbilical cord connected to an instrument van with each crane relocation. From a ship centerline position the crane could work either side of the ship. No sea state limitations were observed. Daily productivity varied from 59 to 147 containers per day. The average capacity for a two-crane system was rated at 250 container transfers per day. Currently, only one hatch bridging kit exists and none are programmed for future buys.

LIGHTER OPERATIONS

Principal lighters used were 1466- and 1646-class LCUs, LCM8s, causeway ferries, LARC-XVs, LARC-LXs, and LACV-30. The lighterage mix and priorities in use were varied by test phase.

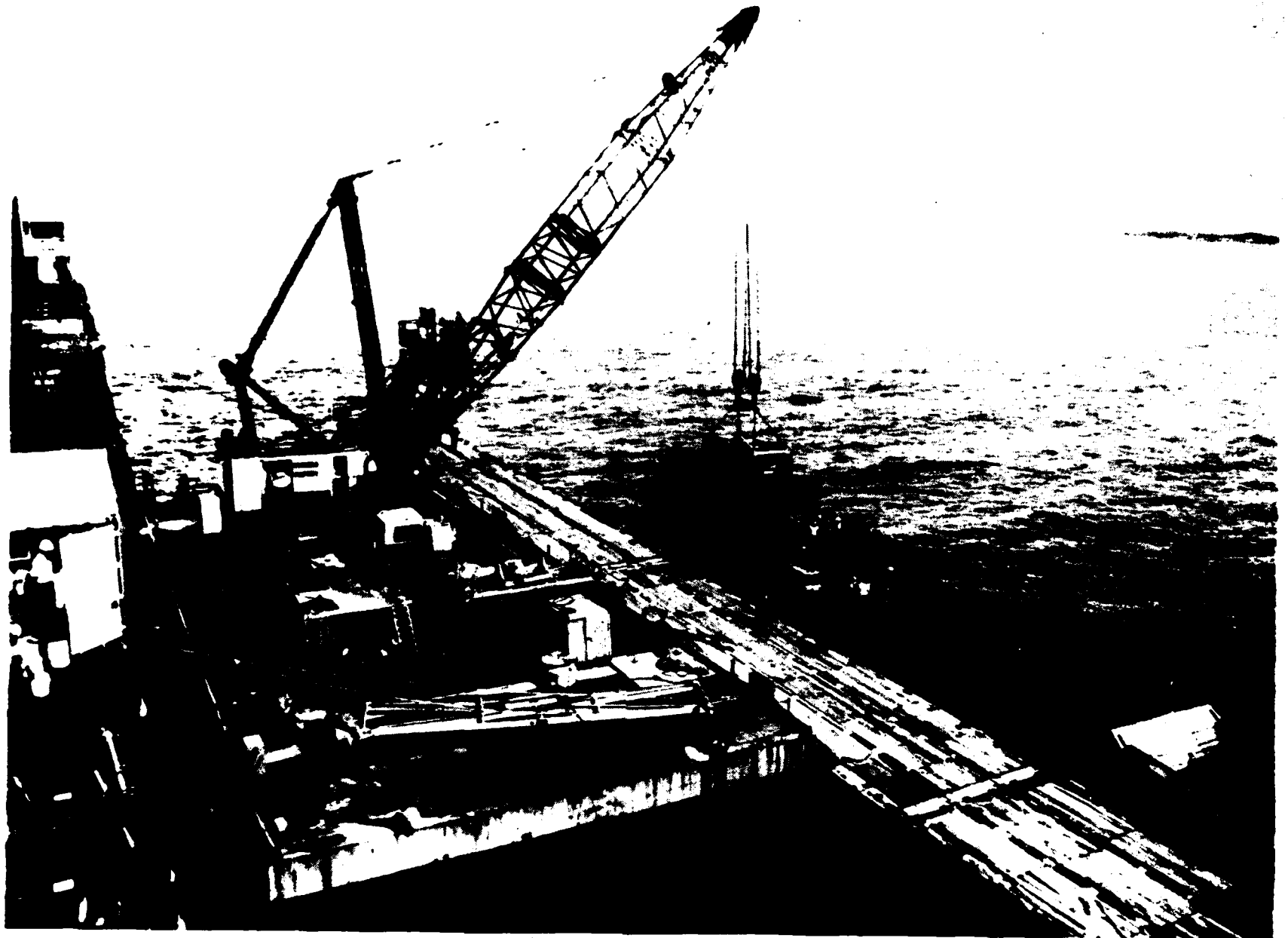

FIGURE 3.1. BARGE TEMPORARY CONTAINER DISCHARGE FACILITY (BARGE-TCDF). The barge temporary container discharge facility (barge-TCDF) averaged 124 containers per day, peaking at 184 during Phase I(R). It is deployment limited to three SEABEE vessels and was found to be weather-sensitive.

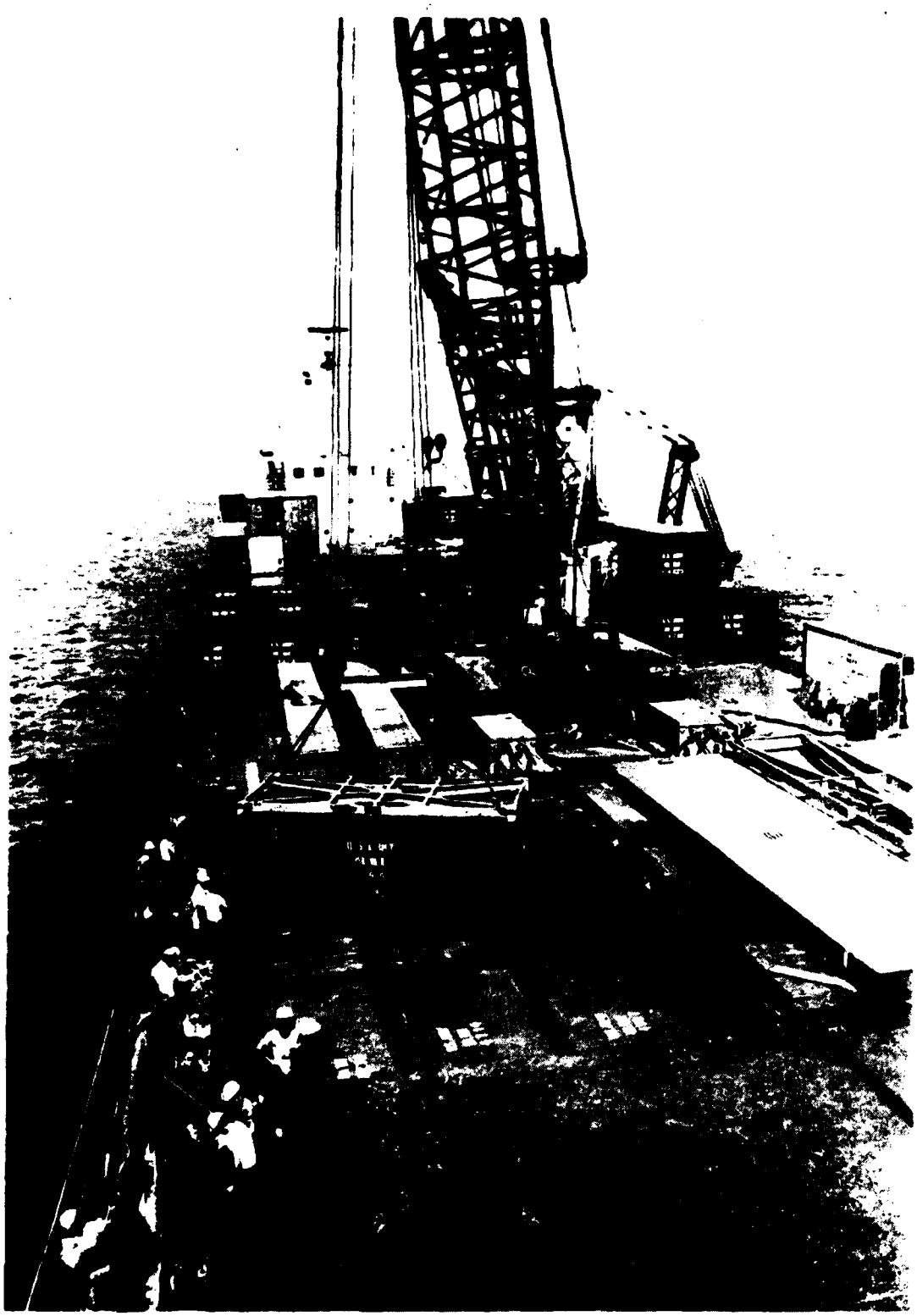

FIGURE 3.2. CRANE-ON-DECK (COD). The crane-on-deck (COD) and its hatch bridging kit worked well. The COD averaged 104 containers per day on the test, peaking at 146 during Phase III. The COD concept, although operationally demonstrated, has not been completely developed as a system (se Vol. II of this report).

Productivity

Total containers transported from ship to shore by lighter type reflect the planned utilization of the various craft and not necessarily their relative productivity. Unit capabilities at varying ship to shore distances with average loads were calculated based upon the test base distance of 1¼ nmi. and are set forth in Table 3.2.

TABLE 3.2

FACTORS FOR DETERMINING UNIT CAPABILITIES AT VARYING DISTANCES (n mi)

UNIT	Average Cntnrs/ Lighter Transit	TEST CASE	FACTORS FOR OTHER DISTANCES				
		Contrs/Day	1/2 nm	1 nm	2 nm	3 nm	4 nm
Med. Boat Co.	2	385	1.30	1.12	0.87	0.71	0.60
Heavy Boat Co. 1400:	4	330	1.22	1.08	0.89	0.75	0.65
1646:	4	350	1.18	1.07	0.90	0.78	0.69
Med. Amphib. Co.	1	350	1.48	1.10	0.73	0.55	0.44
Amphib Barge Tm (LARC-LX)	2	85	1.34	1.11	0.83	0.66	0.55
Med. Amphib (ACV) LACV-30*	1.5	80	1.36	1.03	0.90	0.80	0.71

*Unit structure not assumed. Calculations based on 2 craft available/day.

Army Lighter Highlights

During Phase I control and utilization of all lighters were poor. Recorded crane delay times while awaiting lighters were excessive. As lighter succession time improved at shipside and ashore, throughput rates were greatly improved. Ship cranes were required to be responsive to lighters in terms of frequency (priority) and need to select containers to suit lighter capacities (LARC-XV and LACV-30). Priority in Phase I was given to the LACV-30 over all other lighters.

The LACV-30, the newest lighter tested, has two significant advantages in that it can be deployed like the LCM8 on conventional breakbulk or LASH ships and it is operational over all beaches regardless of inshore under water gradient. Its disadvantages are that it is weight limited in transporting more than one container, uses 2½-5 times the amount of fuel of other lighters (46 gal per container delivered), and has generally poor directional control on land compared with other amphibian (wheeled) vehicles. In comparison with slower large capacity lighters, the higher speed of the LACV-30 is off-set by its average cargo capacity (1.5 containers), regardless of off-shore distance. The LARC-XV is also container weight limited (≤ 15 short tons) but the LARC-LX and landing craft are not.

Navy Lighter Highlights

The Navy used LCUs as their primary lighter with LCM8s for back-up support. A causeway ferry was used alongside the barge-TCDF and lighters moored outboard of it. If a lighter was moored, the container was loaded onto it. Otherwise, the container was placed on the causeway ferry. This procedure reduced crane dependence on lighter arrivals and delays. However, the causeway ferry itself caused some delays because of the amount of time needed to reposition it.

Lighter control methods and management followed the general procedures doctrinally established for amphibious ship-to-shore operations. These procedures generally worked well.

SHORE CONTAINER TRANSFER FACILITIES

General

Since the shoreside facilities were not the limiting factor, the facilities were rated on the basis of potential capacities (off-load and retrograde). A composite rating was determined as the facility planning factor.

Crane-On-Jetty

- A 300-ton lifting capacity crane on a steel plate, sandbag/sand filled jetty (See Figure 3.3). The Army's 300-ton crane was off-loaded, reassembled, installed, and made operational within a time constrained 4-day scenario. Productivity varied from 38 to 192 containers per day. Rated container capacity is 155 containers per day with the loss of 2½ hr each low tide, and 210 containers per day when tides do not influence lighter approaches. Although suitable for the conditions at Ft. Story, flatter beaches would require extending the jetty seaward and its survivability in heavy surf is questionable. Consequently, the Ft. Story results should be considered as applicable only to beaches of similar slopes and the jetty planned for only as a temporary expedient.

Amphibian Discharge Point (ADP) Crane

- A 140-ton crane on the beach (see Figure 3.4) for amphibian-container transfers. The 140-ton crane can be deployed on all ships with a 60-ton boom. The crane was paired with a front-loader for loading tractor-trailer units to expedite crane cycle operations. Because of this and the relative ease with which lighters could approach the crane, the ADP crane had the fastest individual cycles in the test. Daily container productivity varied from 14 to 93. Rated container transfer rate is 225 containers per day.

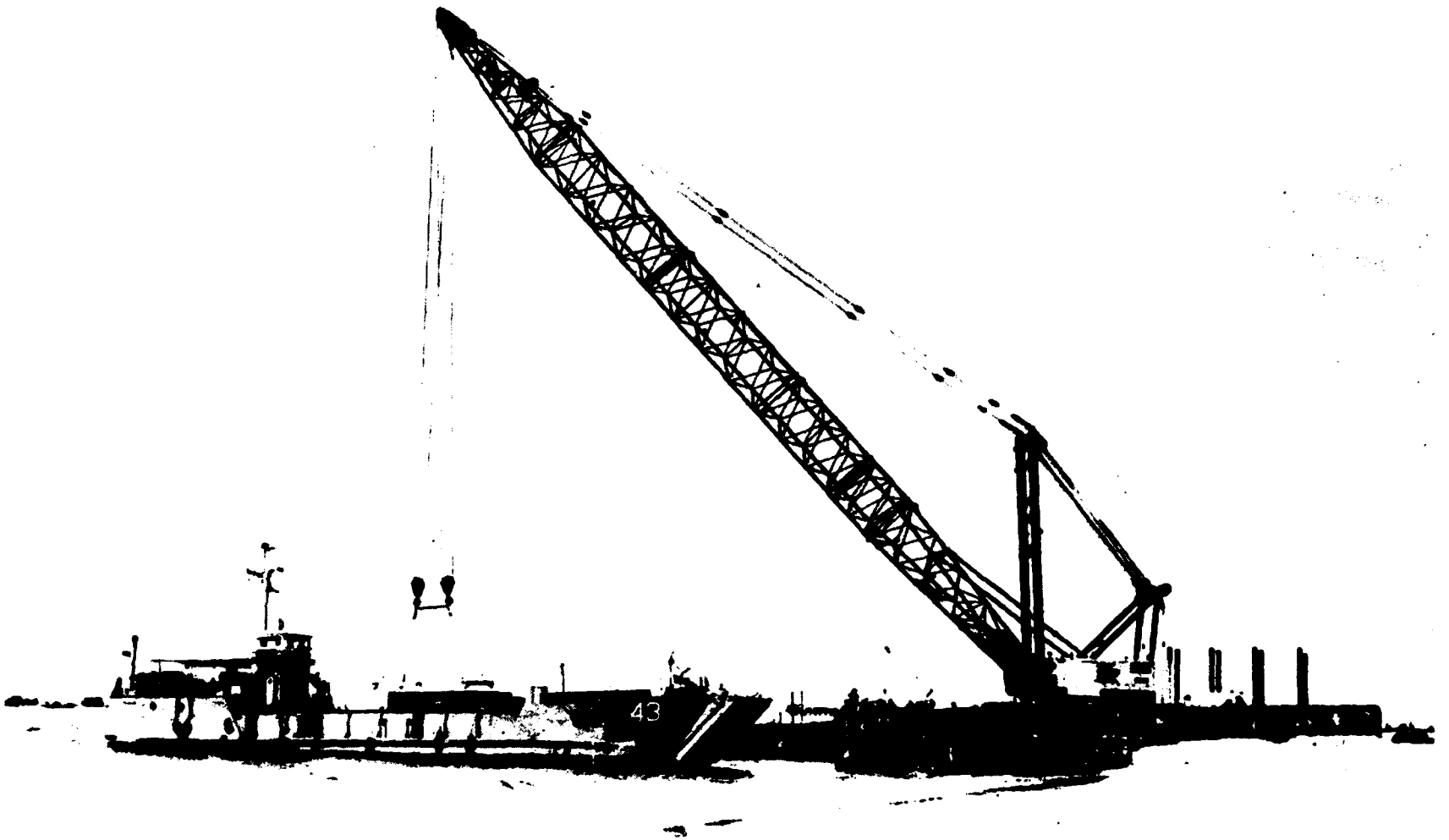

FIGURE 3.3. 300-TON CRANE-ON-JETTY. The 300-ton crane-on-jetty was off-loaded from a heavy-lift breakbulk ship, assembled, a jetty constructed for it, and made operational in approximately one day's time. It demonstrated a sustained rate of 155/210 containers per day depending on tidal conditions.

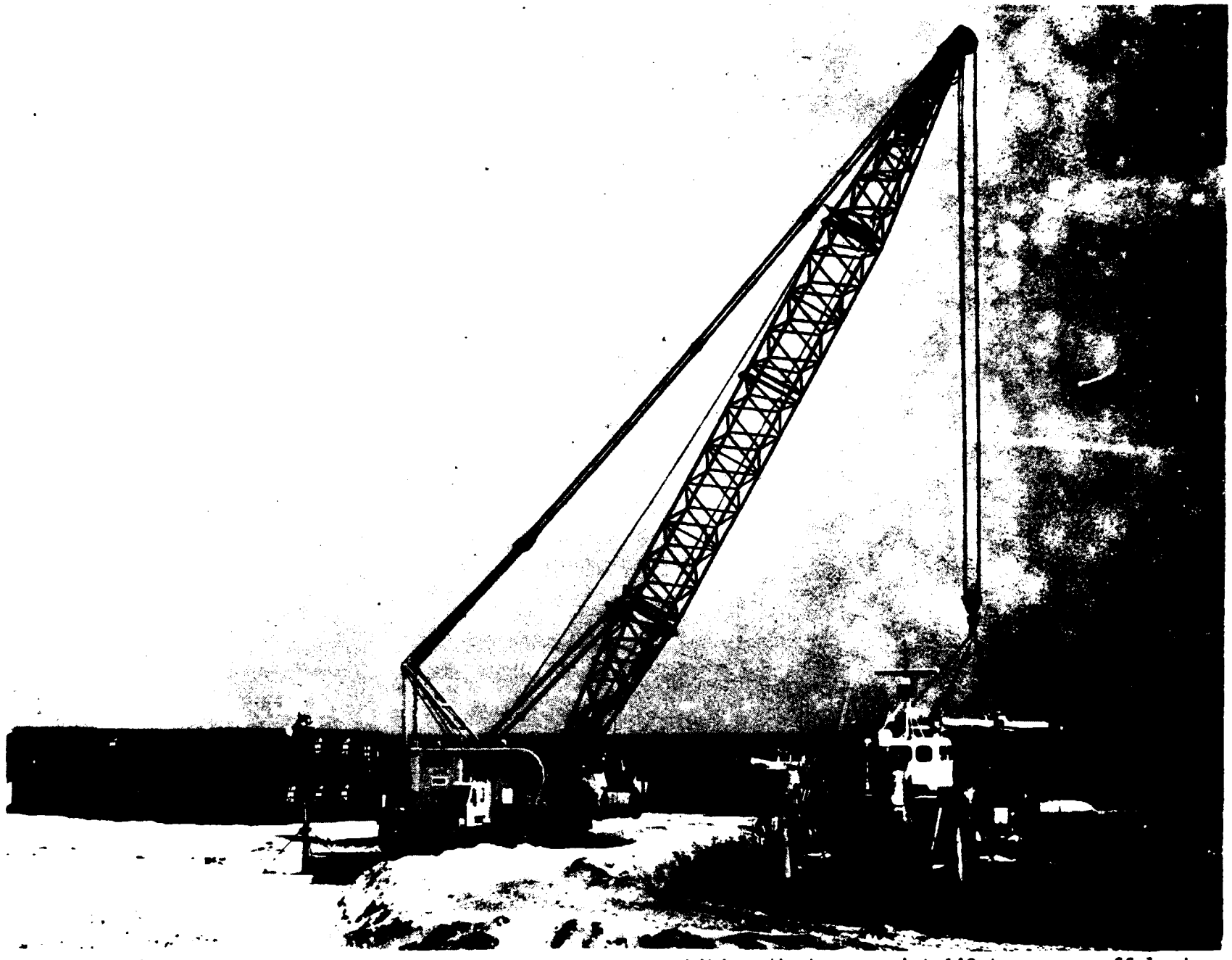

FIGURE 3.4. AMPHIBIAN DISCHARGE POINT 140-TON CRANE. The amphibian discharge point 140-ton crane off-loads a LACV-30. The crane was underutilized and without major breakdowns could support a throughput rate of 225 containers per day.

Elevated Causeway

- A pontoon pier 720 ft long with a 140-ton capacity crane and an air cushion turntable mounted on it (See Figure 3.5). In a first time effort 110 operational hours were required for installation of the experimental facility. A post test effort nine months later took about 65 operational hours. Daily productivity varied from 36 to 132 containers per day. Rated capacity was 195 containers per day. The turntable was effective in keeping truck units available. Lighter succession constituted a major delay factor. A change in mooring procedures and reconfiguration of the pierhead section to permit faster port and starboard mooring of lighters was recommended.

Jacked-Up DeLong Pier

- B DeLong Pier with a 140-ton crane (See Figure 3.6). Deployment is limited to a SEABEE or towing. The DeLong sections were towed to the test site. An A section was substituted for a smaller B section and a side-by-side arrangement was used to simulate two B sections. Installation was accomplished within 48 hours by a port construction company. Operations at first were slowed by delays due to lighter successions and tidal currents. This delay was overcome by using a multiple lighter mooring technique of nesting two lighters alongside. When one lighter had been off-loaded, both cast off and the empty one backed off while the loaded one moved into the vacated position. Productivity varied from 66 to 162 containers per day. Rated container capacity is 200 containers per day.

Lightweight Amphibious Container Handler (LACH)

- An experimental two-wheeled vehicle pushed or pulled by a tracked or wheeled tractor and used to straddle and lift containers (See Figure 3.7). Used in the test to off-load landing craft and in the logistic support area to handle containers. No site preparation was necessary for the LACH but a loading area of Momat was necessary for tractor trailers. The vehicle operated in the mild surf and on landing craft slowly but without difficulty. The vehicle is relatively inexpensive, rugged, and mechanically simple. Some mechanical difficulties were surfaced but these are being corrected. The LACH used in the test was limited to 20-ft containers. Productivity varied from 46 to 69 containers per day. Rated capacity is 120 containers per day for a single LACH.

FIGURE 3.5. ELEVATED CAUSEWAY. The elevated causeway's installation was delayed by deep silt, which required extra long piling, and by inexperience. The system has a potential in sustained operations for a discharge rate of about 195 containers per day without major equipment failures. It can be deployed on all types of commercial shipping with a 60-ton lift capacity or greater.

FIGURE 3.6. JACKED-UP DELONG (JUD) WITH 140-TON CRANE. The jacked-up DeLong (JUD) pier with a 140-ton crane on it is deployment-limited to three SEABEE ships. It can sustain an average rate of 200 containers per day. An "A" section DeLong was substituted for two "B" sections.

FIGURE 3.7. LIGHTWEIGHT AMPHIBIOUS CONTAINER HANDLER (LACH). The LACH off-loads an LCU during the LOTS test. The LACH was rated at a capacity of 120 containers per vehicle per day and can be used with LCM8s and causeway ferries, as well as LCUs. In addition, it can be used as a container handler in beach or LSA dumps.

Beach Clearance Transport

- The Army yard tractor, designed for fixed terminal operations and the 34-ton dual-purpose container transporter, designed for fixed port and highway use, were proved suitable for operations in the prepared beach environment. A total of 22 are required in the unit TOE.

- The USMC modified M-127 trailers were found to be marginally suitable for container transport operations due to the location of the container on the rear end of the trailer bed.

Marshaling Yard

- The area, layout, and traffic circulation routes of the marshaling yard were adequate for the level of container operations generated in this test. Accuracy of recorded container stowage locations was generally poor due to a lack of procedures and an inability of ground controllers to communicate with MHE operators. Inadequate lighting in some areas aggravated the problem during night operations.

Logistic Support Area (LSA)

- LSA container operational procedures overall could not be satisfactorily tested because of a lack of required numbers of USMC MHE. Further definition of USMC beach and LSA operational requirements and procedures is needed.

CONTAINER MHE

Drott Crane

- A 30-ton mobile crane used by the Marine Corps to off-load tractor-trailers in the logistic support area. (See Figure 3.8). The crane cannot normally carry containers so it has to reposition itself for each container lift. It is limited to handling containers weighing up to 21 s/tons. The crane can be used as an interim means of off-loading vehicles in an LSA. It is not well suited for supporting large scale sustained containerized throughput operations.

Frontloader

- Used on the beach and in the marshaling yard. The Army version tested has a 25 s/ton capability and handled both 20- and 40-ft containers. The frontloader performed exceptionally well in loose sand on the beach and in the marshaling yard. A requirement of nine for the Army terminal service container company was determined.

FIGURE 3.8. USMC 30-TON DROTT CRANE. The USMC 30-ton Drott crane was found to be marginally suited in a container handling role.

CARGO DOCUMENTATION AND MANAGEMENT

Remote Processing Facility (RPF)

- A standard milvan refrigeration model was used to house the automated data processing equipment. Although initially not operational, by Phase III the unit was producing all planned documentation support on schedule.

In a container oriented logistic system the volume of cargo and documentation requirements can overwhelm a manual documentation system. Improvements are needed in the prototype system tested to include a "stand-alone" capability with a communications link, mini computer and software. Despite the system deficiencies noted, the RPF demonstrated the data processing needs and potential support capabilities.

STATUS OF CONTAINERSHIP DISCHARGE PROGRAMS

The Army will continue to utilize its barge-TCDFs as an interim measure until a self-deployable container discharge facility is developed under the Navy's Container Off-loading and Transfer System (COTS) program. A second barge-TCDF crane combination will be assembled in FY 80 and by the end of FY 81 three more Army container handling companies are programmed each requiring two barge-TCDFs.

The Navy has developmental tests scheduled in FY 79 through FY 81 on container cranes using an antipendulation device (Rider Block Tagline System), a vertical motion compensation system, and an orientation control subsystem for improved productivity and particularly for discharging operations in sea state three conditions. Following these tests, the Navy will be ready for field operational tests and procurement of system components. A key decision is pending upon suitable hulls for the TCDF facility. The preferred hulls will be operated or leased by MSC for quick response.

Funding for the Navy program is adequate for the planned level of research and development. Procurement of equipment, however, has been limited to six cranes with foundations and would not satisfy all Service requirements.

Until a self-deployable TCDF is fielded, a crane-on-deck system could satisfy NSS containerships' discharge needs. However, only one set of hatch bridging spans now exists and there are no procurements programmed for additional sets. Cranes could be requisitioned or leased on an emergency basis but deployment would be delayed pending fabrication of hatch bridging spans. The hatch bridging spans, which are relatively inexpensive, should be fabricated and stored as contingency project stocks. Subsequently, they could be used on self-deployable TCDFs which won't be available until the mid-80's.

IV. RECOMMENDATIONS

The following are major recommendations based upon analyses of data and observations made during the planning and execution of the Joint Logistics-Over-The-Shore Test and Evaluation program. Additional recommendations are contained in the main body of this report.

- The Department of Defense carefully examine the vulnerability of the LOTS and amphibious follow-on echelon container handling subsystems to environmental factors and mechanical breakdowns; and considering the lack of system redundancy, assess the need for system maintenance requirements and the impact of probable losses of key components on sustained logistic support.

- The Department of Defense review the arrangements (legislative and contractual) under which essential shipping can be made available to the Department when required for military operations.

- OSD MRA&L provide positive direction in the coordination of LOTS/COTS program requirements to insure balanced system support at the earliest practicable date.

- OSD MRA&L support the assignment of an appropriate priority for the early acquisition of a deployable temporary container discharge facility by the Navy in order to meet planned developmental/operational testing in the FY 81-83 time frame.

- Until self-deployable container discharge facilities are available, OSD MRA&L consider the determination of requirements and acquisition of COD hatch briding kits to support most likely contingency operations; and that the kits be positioned at locations to permit the rapid conversion of NSS containership into self-sustaining ones.

- As a priority matter the Army acquire all necessary equipment for discharging, storing, and distributing bulk POL from tankers in a LOTS operation.

- The Army examine trade-offs in the deployment, operating effectiveness, and support costs of alternative mixes of lighters to support most likely contingency situations.

- In conjunction with a review of lighterage requirements the Army examine the relative merit of the LACH, elevated causeway, sand jetty, and DeLong pier in meeting contingency requirements.

- The Army improve the capability of the Remote Processing Facility to include a stand alone communication capability in receiving, processing, and producing terminal documentation, operational status, source data collection, and cargo accounting reports. The Army should also continue training and testing in the use of mechanized documentation for breakbulk and container cargo operations in planned annual exercises.

- The Marine Corps examine container MHE and transporter options and develop LSA operating procedures to acquire an adequate capability to handle containers in amphibious follow-on and resupply operations.

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